

reason his pioneer work should be followed by a similar study of a great variety of seeds and fruits.—WILLIAM CROCKER.

**Light and growth.**—VOGT<sup>19</sup> has shown that the effect of light upon the growth rate of the coleoptile of *Avena sativa* is very complex, in contrast to the older statement that light always inhibits growth. Temporary illumination of sufficient intensity is shortly followed by a considerable decrease, which in turn is immediately followed by a greater and longer enduring increase in growth rate. This increase is due to the action of light alone, and not to the combined action of light and darkness. The initial inhibitory effect of light on growth is not due to increased transpiration, as BLAAUW<sup>20</sup> suggests. In sufficient illumination the rate and total amount of growth of this organ is reduced. The greater amount of illumination causes a second inhibitory effect, which greatly exceeds the former acceleration, so that the total effect is a marked reduction in rate and amount of growth. This total effect of light was all that was definitely studied before JACOBI'S<sup>20</sup> work in 1911. In this total effect, like amount of light gives like effect, even within wide variation of the intensity and duration factors. For a given reduction in growth, *light intensity*  $\times$  *duration of illumination* is a constant. This is the quantity of stimulus law which has been shown to have rather general application in growth and movement stimuli in plants. It seems then that there are three effects of light: inhibition, followed by a greater acceleration upon temporary illumination, and a second inhibition largely determining the total effect in long or enduring illumination of sufficient strength. These results tally in general with those of BLAAUW on sporangiophores of *Phycomyces*, except that BLAAUW has not found important the initial inhibitory effect of light.

While all the work of JACOBI, BLAAUW, and VOGT will greatly modify the statements current in our texts, there is one set of experiments by VOGT which is especially interesting in this respect. When the organ was alternately illuminated (100 M.K. or less) and darkened in 15, 30, or 60-minute periods, the illuminated periods gave less growth only in the 30 and 60-minute periods, and not in the 15-minute periods. In the longer periods, VOGT has shown that the greater growth in darkness is due largely to the stimulation effect of the previous illumination, and the slower growth in light is not due in the main to inhibitory effect of light. This quite reverses the former interpretation given to such results.

Red light acts as very weak diffuse light. This tallies with the known existence in the red of photo-stimulation power. A sudden change of 10–12° C. in the temperature has effects very similar to temporary illumination. This leads VOGT to inquire whether the effect of temporary illumination is not due

<sup>19</sup> VOGT, E., Über den Einfluss des Lichts auf das Wachstum der Koleoptile von *Avena sativa*. Zeitschr. Bot. 7:193–270. 1915.

<sup>20</sup> BOT. GAZ. 59:67–68. 1915.



to a purely physical change, perhaps a temperature change. Some will object to the distinction between physical and physiological changes, for is not the latter, as well as its physical aspects, largely unknown? In this connection it might be mentioned that we know little about the effect of light upon "hydration" of colloids in general, and of cell colloids especially. Recently we have been coming to see that this is quite as important in growth as is turgor pressure.—WILLIAM CROCKER.

**Embryo sac of *Myosurus*.**—In 1913 NAWASCHIN and FINN<sup>21</sup> concluded that chalazogams are primitive and derived from gymnosperms, the conclusion being based largely upon the reduction series shown by sperms. They found that the generative cell of *Juglans* reaches the embryo sac as a binucleate cell, which means that nuclear division had occurred, but that distinct male cells had not been organized. This condition, carried over from gymnosperms, was regarded as an intermediate one between a well developed sperm and a naked sperm nucleus. TCHERNOYAROW<sup>22</sup> has now found the same condition in *Myosurus minimus*, and concludes that this is probably a feature of the "Polycarpicae," and that this phylum and the chalazogams are two independent primitive branches from the gymnosperm stock. The paper also contains a detailed account of the events from the development of the pollen tube to the act of fertilization. In general the events are of the usual kind, but attention may be called to the fact that the author lays special stress upon the idea that there is some coordination which assures the discharge of the pollen tube at the moment of maturity of the embryo sac.—J. M. C.

**Northern plains forests of Canada.**—A recent report by CONNELL<sup>23</sup> deals with the forest region lying north of the prairies in Manitoba, Saskatchewan, and Alberta. It extends from the contact line with the Laurentian pine plain near Lake Winnipeg in the east, to the Rocky Mountains in the west. The northern limits are not determined. If the portion of northern Alberta most carefully studied be taken as typical of the entire region, it is made up as follows: (1) boulder clay slopes, which comprise about 50 per cent of the area, more than half of these slopes being covered with a poplar association, a little less than one-fourth with a mixed spruce-poplar forest, and less than 2 per cent with a pure spruce association; (2) sand ridges, which amount to 18 per cent of the area and are covered with nearly pure *Pinus Banksiana*, *P. Murrayana* appearing in mixture with it in the western portion of the region; (3) swamps, which occupy the remainder, showing how poorly developed the drainage is. In the swamps there is a stunted growth of *Picea mariana* and *Larix laricina*, the former predominating.—GEO. D. FULLER.

<sup>21</sup> Rev. Bot. Gaz. 57:162. 1914.

<sup>22</sup> TCHERNOYAROW, M., Les nouvelles données dans l'embryologie du *Myosurus minimus* L. Mém. Soc. Nat. Kiew 24:95-170. 1915.

<sup>23</sup> CONNELL, A. B., Some aspects of the northern plains forest region of Canada. Forestry Quarterly 13:31-34. 1915.